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Learning and knowledge sharing in a networking environment

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SUMMARY

This thesis addresses knowledge sharing and learning among mobile knowledge workers. The main focus is to study how mobile knowledge workers use knowledge sharing in their work and how these different knowledge-sharing situations could be supported by IT. This is further underlined by two research questions: How do mobile knowledge workers use knowledge sharing in their daily work? How can knowledge sharing among mobile knowledge workers be supported? The study was conducted at a large R&D company in Sweden, using qualitative, ethnographic observations of five mobile knowledge workers. The findings established that a large part of the workers days are concentrated around knowledge sharing in different situations, where the personal and work-related network is an important part. The extensive communication between people, both face-to-face and through different mediums, make it important to locate people and to know if they are available for communication. The extensive mobility among the people studied makes these issues uncertain, since the mobile knowledge workers constantly move between the home office and other parts in the building, or travel to other locations in the world. The findings are divided into four different situations of knowledge sharing: Knowing your nodes, Knowledge sharing about meetings, Locating for unscheduled meetings and Communication of availability. Design implications concerning these different situations are presented, where indications about how knowledge sharing and learning in these situations could be supported with IT. These implications contain both guidelines and more concrete examples of possible IT support for specific situations.

Keywords: Learning, Networking, Mobility, Knowledge, Knowledge Sharing

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We wish to thank Jan Wickenberg and Kerstin Forsberg for answering all of our, sometimes fuzzy, questions about the studied organization.

Last but not least, we wish to thank our five study objects. Without them, the thesis might have lost a point or two.

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Per Ahlström, Martin Berg & Adam Winberg

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1 Introduction

New technologies have a profound impact on the nature of work in knowledge intensive organizations. Communication mediums such as e-mail, voice-mail and shared intranets support co-operative work over long distances. Due to this, projects can contain participants from all over the world who do not necessarily have to be at the same place at the same time in order to work together. These communication tools diminish distance as a negative factor in co-operative work.

Work in general has developed from being mostly manufacturing to consist of primarily service work. The main difference is, according to Ljungberg and Kristoffersen (2000), that this has led to a shift in location. Manufacturing took place where the factory was, whereas service work is more flexible in terms of where the actual work is performed. This makes the service workers, and the society as a whole, more mobile (Ibid). This increase in mobility of people is accompanied by an exploding market of mobile technology, for example mobile phones, laptops and handheld computers.

Paired with the new technologies, new forms of organizations appear where this kind of mobility in work is very common. New, emerging business strategies can change the way knowledge is shared and managed. Globalisation as a business strategy works as a driving factor for knowledge sharing and development, since people with very specific knowledge often have to work together over large distances to solve problems or coordinate projects (Hawryszkiewycz, 1999).

Interaction between people in organizations is thus an increasing part of work for many people. According to Ljungberg and Wiberg (1999) both face-to-face communication and communication mediated through electronic devices have increased in recent years. Cooperation and interaction also leads to mobility as people travel to meet each other physically (Ljungberg & Kristoffersen, 1999).

The pressure on the knowledge intense workforce increases with the continuous move towards the “knowledge society”. They face higher demands on their knowledge and adaptability to be able to compete. Education and other forms for knowledge development are considered to have a crucial significance for the economical and technical progress in work life (Ellström, 1992).

The combined increase of both mobility of people and importance of knowledge management at work creates an interesting research area. Today’s organizations are more and more depending on knowledge work, and today’s workers are more and more depending on ways to make knowledge sharing function while being distributed. How to successfully implement support for mobile knowledge work is an interesting issue in knowledge management. This thesis discusses these problem areas from a socio-technical point of view by studying mobile knowledge workers and how they share and use knowledge in their work. We view mobile knowledge workers as people that typically work in a knowledge-intensive organization and are highly

mobile in their work, both locally and remotely. Their work is centred on knowledge and interaction, which makes it an interesting work group to study in a learning and knowledge sharing context. The aim is to create implications for design for knowledge sharing and management by mobile people.

1.1 Purpose of thesis

The focus of this thesis is set on the need for information and learning in mobile knowledge-based work. The thesis will discuss individual learning as well as knowledge sharing among mobile knowledge workers, focusing on the latter. The purpose is to understand learning and knowledge sharing among mobile knowledge workers and to examine the possibilities of developing IT-support to assist and enhance learning situations for this kind of work.

This purpose leads up to the following research questions that this thesis aims to answer:

How do mobile knowledge workers engage in knowledge sharing in their daily work?

How can knowledge sharing among mobile knowledge workers be supported by IT?

1.1.1 Delimitations

This thesis is mainly focused on personal knowledge management, and not knowledge management in an organizational sense. However, the terms will be explained and presented to make the difference clear. Furthermore, we will present implications for design of IT-support, but actual development lies out of the scope of the thesis.

1.2 Disposition

This thesis is divided into seven parts: introduction, theoretical framework, method, result, analysis, discussion and references. Here we shortly explain and present the contents in each chapter.

In the introduction we discuss the background of this study. We motivate the study and present our aim with the thesis.

In the method chapter we present the methods we have chosen in order to conduct our study. The chosen methods are briefly described and the choice of the different methods is motivated.

The theoretical framework is divided into three parts, where knowledge, mobility and personal networks are explained and different theories concerning these areas are presented.

The organizational description describes the organization where this study has taken place. We also describe the environment, i.e. the site where most of the field work has been conducted.

The result chapter presents the result and analysis of the study. We describe our main findings from our observations and interviews. These consist of four main findings concerning situations where knowledge sharing and learning are essential: Knowing and managing your nodes, Knowledge sharing about meetings, Locating for unscheduled meetings and Communication of availability.

The design implication chapter presents implications for design, derived from our findings from the study. They are divided into four categories according to our findings, where we discuss how IT could support the different situations, what should be considered when designing for these situations and also more concrete suggestions for design.

The discussion presents our conclusion, drawn from the analysis of the study. Suggestions are also made for further research in this area.

In the reference chapter books, articles, journals and other information sources used in this thesis are presented.

2 Method

In this part we present the methods we have chosen in order to conduct our study. The chosen methods are described and motivated. We furthermore discuss reliability and validity of the study and our analysis of the gathered data.

2.1 Research approach

According to Eriksson and Wiedersheim-Paul (1997) there are basically two research approaches that are used in modern research, positivism and hermeneutics. Positivism is a relatively old approach that aims at conducting research that is based on positive knowledge. The researcher uses formal logic and facts that have been acquired by measurement. Hermeneutics is according to Repstad (1999) all about interpretations. The researcher tries to link concrete observations with general characteristics and contexts by interpretations. The hermeneutical interpretation process is often illustrated in the shape of a circle or a spiral.

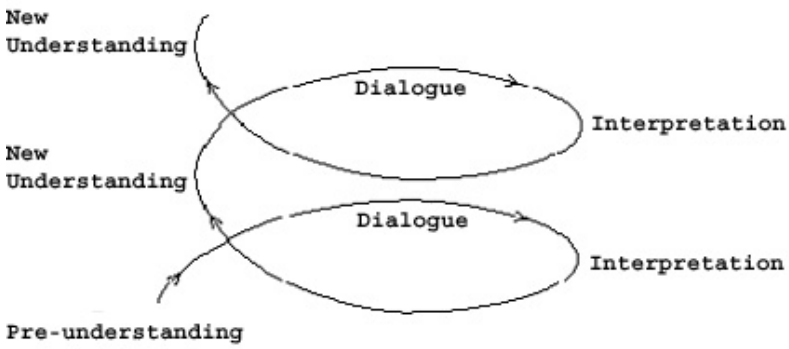


fig. 1. The Hermeneutic Spiral.

The spiral continues in additional revolutions where new questions and problems are found and interpreted.

Due to the personal and social nature of knowledge sharing, we used the hermeneutic approach to be able to interpret and understand our findings. Furthermore, since our study is explorative, i.e. we try to understand and identify certain situations of mobile knowledge work, it would be difficult to find valid measurements of this with a positivistic approach. These difficulties imply a risk of missing out on information that could be of interest for this study, since the preset measurements of the study could limit the gathered data.

2.2 Ethnography

Ethnography is a research method that has been developed from anthropology with the purpose of studying human society and culture. The ethnographical researcher is mainly interested in information that involves the social environment of the study objects. (Merriam, 1994)

Ethnography as support for design has gained great interest among researchers. This is especially the case concerning research on computer support and not least research on CSCW. According to Wasson (2000) this is mainly because software designers earlier had a tendency to create software from the basis of how they instinctively thought the users would interact with the software. The real needs of the users were ignored or lost. This could be avoided if the design would have been based on ethnographical studies according to Wasson (2000).

Hughes et al (1994) have developed four different methods to use ethnography in systems development. These four are briefly presented below.

Approach	**Description**
Concurrent ethnography	The design is influenced by an on-going ethnographic study, taking place at the same time as systems development.
Quick and dirty ethnography	Short ethnographical studies are conducted with the purpose to provide a general but informed sense of the setting for designers. The researcher accepts the fact that this method cannot provide a full and detailed understanding of the setting.
Evaluative ethnography	An ethnographic study is conducted in order to verify or validate a set of already formulated design decisions.
Re-examination of previous studies	Previous studies are re-examined and used for initial design thinking.

Our study is based on the "Quick and dirty" approach. This method is suitable when conducting ethnographic research from a design point of view. It gives a relatively wide description in a short period of time, which suits our purpose well since our aim is to identify general design implications for IT-support in a specific area.

2.3 Data gathering

A typical distinction regarding methods of data gathering is between using qualitative and quantitative methods. When using quantitative methods, the researcher transforms information to numbers and amounts. Based on this statistical analysis is performed. When using qualitative methods it is the researchers understanding or interpretation of information that is in focus, i.e. interpretation of motives, social processes and social contexts (Holme & Solvang, 1997). The methods that we chose for the study were all

qualitative, since the hermeneutic approach is based on the interpretation and understanding that these methods focus on.

Below is a model illustrating our activities during research. The x-axis represents time and the y-axis represents our research focus getting narrower over time. The narrower focus was obtained since our areas of interest were formed over time as we learned more about the research area. The model is not according to scale and does therefore not illustrate the actual work effort put in.

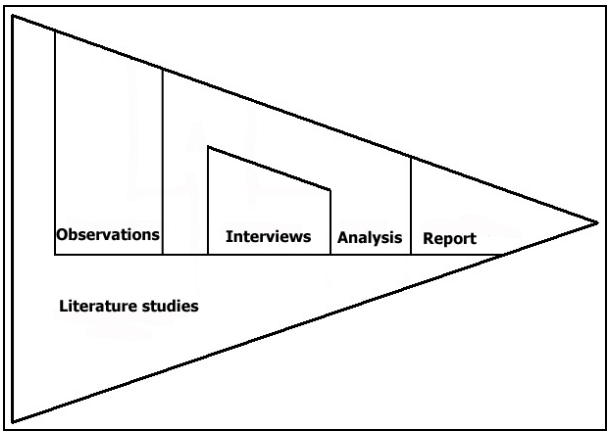


fig. 2. Illustrative model showing our choices of methods.

The techniques chosen for data collection were, as illustrated in the model above, literature studies, observations and follow-up interviews. The follow-up interviews were conducted to gain more knowledge about our observations by letting our study objects comment and further discuss these. In addition, we also made preparatory interviews with the persons we were about to study. These interviews were made prior to the observations and gave us a basic understanding of our study objects and their work. It also gave us an understanding about what to expect in the observations and what areas that would be important to focus on. The techniques used in our study are briefly described below.

2.3.1 Literature studies

To get a pre-understanding about the research area before the actual fieldwork started, we initially performed a review of previous work in the areas of mobility, learning and knowledge management. The choice of literature was at the start of the study based on our understanding of the three subjects. Since our research focus developed over time, so did our choice of literature. Our search was centred on literature about these issues in a work-related context. Further filtering was done regarding IT-related literature since this is a dynamic research area where date of publication to some extent is a measurement of applicability. More general literature about these subjects was also studied to create our own understanding about this. The literature studies were a concurrent activity during the entire project time.

2.3.2 Study objects

This study was conducted at a large research and development company in Sweden. According to Ljungberg (1997), R&D companies are typically very knowledge intensive organizations, which is why we believed that the chosen organization would be interesting to study from a learning point of view. The study was thoroughly explained to our contact persons at the company, who then in turn made suggestions regarding different persons that could be suitable for the study. Since the contact persons have in-dept knowledge about the employees and their work, we believed that this was the best solution rather than making the choice ourselves. Five persons at a middle-management level were suggested by the contact person, all with coordinating roles and a high level of mobility in work. The mobility of these persons is constituted by both mobility at a certain place, such as the home site, and travelling to other places in the world, typically for meetings or conferences. They thereby fit in our description of mobile knowledge workers.

2.3.3 Observations

Observations are a common method for data gathering in ethnographical research. The greatest value of observations is according to Repstad (1999) that it gives direct access to the social interaction that the study objects have between each other in the organization. Since social interaction is an important part of knowledge sharing, the use of observations as a mean for data gathering was deemed as suitable for this study.

There are several different ways of conducting ethnographical observations. Holme and Solvang (1997) distinguish between open and covert observations. Open observations mean that the studied persons are aware of the observation and accept this fact. Covert observations are conducted without letting the study objects know that they are being observed (Repstad, 1999).

We chose to perform open observations. The reasons for this were many, e.g. time and ethics but foremost that we would not have been granted access to the field otherwise. When performing open observations the researcher also has to be accepted by the study objects and gain their trust, but when this is achieved she has a freer role than in the covert observation. This free role is obtained since the researcher can work openly as an observer and does not have to hide the real intentions of his presence (Repstad, 1999).

Emerson et al (1995) describes the practicalities of making field notes during observation. Among other things they describe a way of making jottings, where the researcher writes symbols and abbreviations during the observations. The observations are later written down in full. The reason for this practice is that it often is too time-consuming to write every word fully during the observation. Since we were three researchers doing observations we first decided on a similar way to write our notes so they easily could be compared later. By doing this we believe that we saved time in the analysis phase. Since our notes were written in the same way and focusing on the same things the classification of data went smoothly. The researcher

completed every day of observation by writing down the observations in full. The advantage of doing this so soon after the actual observation is the possibility to enrich and develop the notes when still having them fresh in mind.

In accordance to the purpose of this study, we tried to focus our observations on situations of learning and knowledge sharing. We used a broad definition of these situations, to avoid the risk of missing interesting information, by seeing them as interaction between people in some way. Furthermore, we were interested in these situations where some sort of mobility was involved, such as walking around or travelling. We also tried to observe situations not necessarily regarding interaction, but with some connection to upcoming or previous interactions. Since it is hard to observe how these interactions are conducted through mediated communication, such as e-mail or telephone, the observations mainly concerned face-to-face interaction.

We observed each study object for three days. Below the days in the field are summarized.

Study Object	**Day 1**	**Day 2**	**Day 3**	**Researcher**
Ben	09.00-14.00	08.00-17.00	07.30-16.00	Adam
Eric	08.00-17.15	12.00-17.15	08.30-17.00	Martin
Fred	08.45-15.30	08.45-15.30	08.30-20.00*	Adam
Carl	09.00-17.30	09.00-16.30	09.15-14.15	Per
John	08.20-16.00**	06.00-19.00*	05.45-17.00*	Martin

* The day was spent out of town. Travel time is included.
** The day was spent in a conference hotel located near the site.

tab. 1. Summarization of the days in the field.

2.3.4 Interviews

According to Merriam, (1994) the usual way to determine which type of interview to perform is to decide how structured one wants the interviews to be. Interviews that are structured to a large extent can be resembled to quantitative surveys and interviews that are structured to a small extent can be resembled to everyday discussions. Merriam (1994) finds the structured interview to be suitable when one is about to perform many interviews and wants to quantify the results. In qualitative research it is more common with interviews that are structured to a small extent (Ibid.).

Holme and Solvang (1997) declare the strength of the qualitative interview to be that it resembles to an everyday situation in the form of an almost normal conversation. The control of the respondent is small; the researcher only gives theoretical frames for the conversation or interview. Easterby-Smith et al (1991) points out the risk with this kind of unstructured interviews. They mean that there are going to arise unclear matters between the interviewer and the respondent if there is no steering made by the interviewer. We used what Järvinen (1999) calls semi-structured interviews where the researcher steers the respondent to a small extent. The purpose with this is to get an

understanding of the respondents' way of seeing things, without forcing them on our, sometimes preconceived, view.

The interviews were led by one researcher following an interview guide. One other researcher were however also present to assist the interviewer if necessary. The interview guide was divided into four blocks, deriving from our observations. Each block was divided into several loosely defined questions, or interest areas. The interviewer used these blocks and questions as a starting point, and derived new questions and ideas from the discussion the questions started. Each block was explained and exemplified before questioning. We also used printed out excerpts from our study that the respondent could comment and discuss. These excerpts were used to exemplify the four different blocks.

We interviewed four of the five mobile knowledge workers who participated in our ethnographic observation study. Due to time shortage, the fifth interview could not be conducted in time to be included in this thesis. The interviews were scheduled for approximately one hour and held by two people, where the one who carried out the observations with the current interviewee was in charge of the session. The other took notes and asked additional questions. Both the interviews and the pre-study interviews were audio recorded and transcribed in full.

The aim of the interviews was to validate our analysis of the data collected during the ethnographic study. The interviews also gave the respondents a chance to look over the results from the study and comment on our findings. It gave us the opportunity to get additional information about specific situations and in that way strengthen our study.

2.4 Validity and reliability

Validity is a measurement describing to what extent a method examines what it is supposed to examine (Kvale, 1997). In our study this means how well our observations mirror the situations we are interested in.

It is common to distinguish between inner and outer validity. Inner validity refers to how well the results agree with reality. Outer validity refers to what extent the results are applicable in other situations then the one examined. (Merriam, 1994)

We believe that our study have a high degree of inner validity. Given the fact that all five of the studied people to a high extent meet the requirements of a mobile knowledge worker, we believe that our results are valid for this kind of workers. We furthermore believe that we have chosen days to study them that are representative of their normal workdays, although it may be difficult to define a normal workday.

It is difficult to make conclusions about the outer validity of our study. The studied people have very task specific jobs, but the way they are mobile and dependent upon knowledge is not unique, why we think that the outer validity is quite high too.

Reliability measures the results accuracy. (Holme & Solvang, 1997) High reliability is obtained if a study would produce the same result if done a repeated time (Merriam, 1994). Merriam further means that reliability is a difficult concept within community studies since the behaviour of people is in constant change and not statically. Since there are many different interpretations of something that happens, there cannot be any static points to use for repeatedly measuring an event. It is therefore not possible to get a reliable measurement of what we measure in the field of qualitative research. The results in qualitative studies will inevitably be interpreted and affected by the researcher, which is why we do not consider reliability as a good measurement of quality in qualitative research.

2.5 Analysis

In quantitative studies the data often is structured in advance, which is not the case in qualitative studies. Qualitative data must be structured afterwards, when the data is gathered, which makes the analysis a more time-consuming and lengthy procedure than when the data is quantitative (Holme & Solvang, 1997).

Repstad (1999) means that the researcher in her qualitative research must perform repeated adjustments between being narrative and over-interpretative. To be narrative is described as the technique used when one only describes the studied phenomenon and over-interpretation is to perform theoretical interpretations on everything one has seen in the field.

We have tried to be as unprejudiced and describing as possible during the phases of data gathering in our research. The interpretations and theoretic connections of what we have seen have been done in a latter phase of the project.

Repstad (1999) means that a way to handle large amounts of qualitative data can be to classify the material into themes that appear repeatedly in the data. They describe a risk in using this technique as one then lifts some things out of their context and thereby risks of losing the perspective of the whole picture (Ibid). With this risk in mind we kept the original observations to go back and if necessary compare to during later phases of analysis. The observations were then divided into themes. This process was very time consuming but gave us the benefit of an almost full control of our notes. The process of categorization was iterated several times as we discovered new interesting categories. We experienced the problem of cutting observational notes out of their context, but since we still had copies of the original notes, this never became a real problem.

3 Theoretical framework

This chapter presents the theoretical framework for this thesis. It is divided into three parts, where knowledge, mobility and personal networks are explained and different theories concerning these areas are presented.

3.1 Knowledge

To understand what knowledge is, it is important to separate between the different terms knowledge, information and data. Though they undoubtedly have a close connection, there are crucial differences. The meaning of the different terms is not unambiguous, different organizational cultures and values affect what we see (Collins et al, 1998). Because of this we make a short description of each term below.

3.1.1 Data

Data is a representation of a fact, for example numbers in a table. Important is that the representation is without meaning or interpretation, it's just a mere number (Eriksson and Wiedersheim-Paul, 1997). Data is the building stones of information. Data becomes information when it is designed for a special cause, for example when economic data is compiled into an economic statement (Collins et al, 1998).

3.1.2 Information

Information is interpreted data, i.e. facts that are put into a specific context (Collins et al, 1998). Davenport and Prusak (1998) describes information as "*a message, usually in the form of a document or an audible or visible communication*".

Although knowledge and information often are used to describe the same thing, the two terms are important to distinct. Information can further be described as a flow of messages, while knowledge is something that is created from this flow (Nonaka, 1994). Information is therefore not knowledge, but a crucial building stone essential for knowledge creation (Collins et al, 1998).

3.1.3 Knowledge

Knowledge is according to traditional epistemology defined as "justified true belief" (Nonaka, 1994). Davenport and Prusak (1998) defines knowledge as a mix of experience, information set in context, values and insight that provide a framework for creating and assessing new knowledge.

Tacit and explicit knowledge

In this thesis we make use of the distinction between explicit and tacit knowledge to further understand knowledge- creation and sharing. Explicit knowledge is knowledge that can be communicated in formal, systematic language (Nonaka, 1994). Tacit knowledge, also called implicit knowledge, is owned by individuals but hard to communicate because of its personal nature and complexity (Ellström, 1992). It is

deeply rooted in action and involvement in specific contexts. Examples of this type of knowledge are know-how and skills to perform specific tasks (Nonaka, 1994).

Knowledge conversion
Information becomes knowledge when it is processed and interpreted in an individual's mind. The knowledge becomes information again when it is expressed in words or in writing (Alavi & Leidner, 2001). The concept of knowledge creation through knowledge conversion is described by Nonaka (1994) and presented below in a model of the different modes of knowledge creation. The four modes are socialization, externalization, combination and internalization. These modes suggest that knowledge creation is based on conversion between tacit and explicit knowledge. Knowledge creation is a spiralling process of interactions between tacit and explicit knowledge, and these interactions lead to the creation of new knowledge (Nonaka & Konno, 1998).

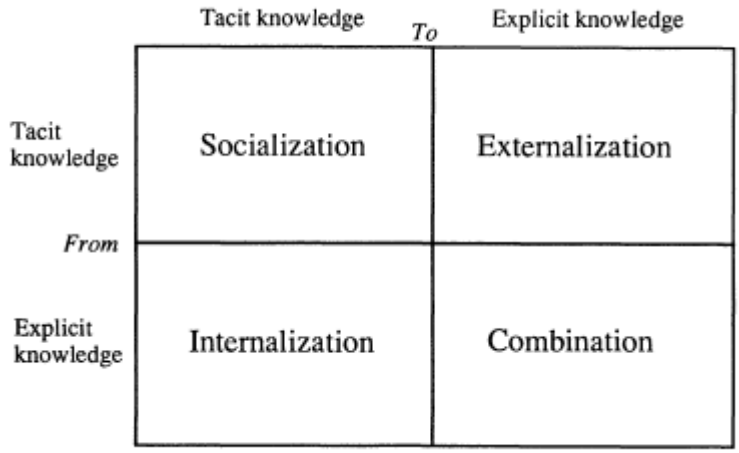


fig. 3. Model of knowledge conversion (Nonaka, 1994)

Socialization is the communication of tacit knowledge through interaction and socialization between individuals. The key for this kind of learning is social interaction with other people, and it is the process of sharing experiences that socialization is referring to (Nonaka, 1994).

Externalization is the conversion of tacit knowledge to explicit knowledge. For this knowledge creation process to take place, tacit knowledge must be translated into a form that can be understood by others (Nonaka & Konno, 1998). This can be achieved through some kind of codification of tacit knowledge.

Combination is the process of creating explicit knowledge from explicit knowledge. The reconfiguring of existing knowledge through the sorting, adding and re-contextualizing of explicit knowledge can lead to new knowledge. A good example of this is communication systems, which give the opportunity to combine different bodies of explicit knowledge possessed by individuals (Nonaka, 1994).

Internalization of created knowledge is the conversion of explicit knowledge to tacit knowledge. This process is similar to the traditional notion of learning (Nonaka, 1994). Learning by doing, training and exercises make the conversion to tacit knowledge possible (Nonaka & Konno, 1998).

3.1.4 Knowledge Management

The increased competition in different markets has resulted in a view of knowledge as an increasingly valuable asset within organizations. Grant (1996) means that critical competition advantages are not created by knowledge per se, but from a well functioning integration of knowledge within the organization. The role of management in the knowledge development of an organization is to view every co-worker as an important resource and make it easier for everybody in the organization to learn and develop their knowledge, both by themselves and together with others (Collins et al., 1998). This view of knowledge management as a way of supporting employees in their knowledge sharing and learning is also supported by Alavi and Leidner (1999), who states that knowledge management is a systematic and organization specific process for collection, organization and communication of both tacit and explicit knowledge among employees.

We view knowledge management from an individual point of view rather than as organizational directives and guidelines. Thus, knowledge management is in this thesis viewed as a collection of personal methods to create, organize and communicate knowledge.

Hansen et al (1999) describes two common approaches that focus on how to resolve the specifics of knowledge management, as described above. These approaches, codification strategy and personalization strategy, are presented below.

In the codification strategy the company centres on the computer as a resource for knowledge. Knowledge is codified and stored in databases, which serve as repositories of knowledge for the employees (Hansen et al, 1999).
The personalization strategy takes a more individual approach to knowledge management, focusing on support for communication and interaction between people as the main source of knowledge. Computers are here used to support the communication of knowledge, and not so much to store it (Hansen et al, 1999).

Information systems for knowledge management
King et al (2002) define knowledge management from an IT point of view, by emphasizing that knowledge management involve new information systems based on the already existing IT infrastructure. The IT point of view is used since much of the issues in knowledge management, such as capture, storage and communication of knowledge, is much alike the problems IS functions have dealt with for decades. King et al (2002) have described some different systems for knowledge management strategies, which are presented below.

Knowledge repositories. Databases which allow storing and access to documents and research results within a varied array of fields.

Best-practice and lessons-learned systems. Databases which gather information about the organizational policy in different business areas. This system also collects lessons learned from concluded projects to prevent already made mistakes to be repeated.

Expert networks. Networks with individuals who are considered to be experts within a specific field. The network should be accessible for others who have questions related to the field of expertise.

Communities of practice. Networks with groups which members are informally linked to each other through a mutual expertise and interest in a specific domain.

3.2 Mobility

Ljungberg and Kristoffersen (1999) define the characteristics of mobile work by identifying typical situations where mobility exists. They have developed a model where three different modalities of mobility among mobile workers are presented, travelling, visiting and wandering. These are described further below.

Travelling is to take oneself from one place to another using some means of transport, for instance a train, car or airplane. The duration of the mobility is of importance, since different durations of the travelling situation cause different possibilities and requirements for work. The means of transportation is also an important aspect of this modality, since different transportation means have different potential for IT support.

Visiting is to spend a certain period of time in a certain place and then move on to another place. The visiting modality describes the kind of mobility that happens when people spend limited time at different places.

Wandering is mobility within a limited area, such as the home base or at a remote site. This type of mobility consists, as the name implies, to a great deal of walking around, which is a mobile situation also identified by Bellotti and Bly (1996).

Bellotti and Bly (1996) use the term local mobility to describe walking around at a certain location. Their study showed that the local mobility was important to keep the workers up-to-date with the progress in the different projects, but also to get access to information about other things. The workers expressed that they prefer face-to-face contact before for example e-mail or telephone to achieve this communication.

By pointing out differences between stationary and mobile work, certain mobile needs can be identified. Perry et al (2001) indicates that stationary work in an office mediate more security than mobile work since the worker in a stationary setting knows what kind of resources are available and what can be expected of the environment. Mobile work often means work in several different environments, which probably are more insecure to the worker regarding available resources, technology, communications and

workspace. Perry et al (2001) states that the resources and information associated with the stationary workplace must also be made available for the mobile worker, regardless of time and place. If successful, these efforts would make it possible to avoid the insecurity associated with mobile work (Ibid).

Brown and O'Hara (2002) emphasizes place as an important factor of mobile work. In their study of mobile workers they have seen how the workers adapt their work to the current context. Different tasks require different technological and environmental prerequisites, which becomes a big part of planning the working day. For example, the home office might be the most suitable place for checking e-mails due to technological advantages compared to a train or an airport. These places are in turn a good place for reading reports and checking voice mail (Ibid).

Perry et al. (2001) have sought to find out how different activities are linked to different situations where mobile work is being done. The study presents four situations, presented below, where mobile technology is being used to increase flexibility and to access information while on the move.

- *Planning opportunistic access to information.* To plan ahead of ones mobility by, for example, making sure that important documents and other types of information are available in a suitable format. This planning can also consist of thinking ahead to see if there could be any time or place to use some specific equipment, for instance a laptop with wireless LAN.
- *Working in dead time.* The "dead" time that arises while waiting at an airport, in a car queue or at a train station can be used for work. By using this extra time the workload can be reduced. The conditions for this type of work are very different, depending of the context. It is for example easier to use a laptop at an airport's waiting hall than in a car queue.
- *The phone as a device proxy.* The study showed that the flexible nature of the mobile phone made it frequently employed to solve situations where needed equipment or information was not available. The phone was then used to get access to these resources from a remote location. An example of this is to call the office to get a document faxed to a customer or to get your e-mail read and answered by dictation.
- *Remote awareness monitoring and access to colleagues.* An important aspect of work is to stay up-to-date with progress at the home office even if you are mobile. The study showed that this was carried out partly by e-mail, but principally through using the mobile phone to call colleagues and get the latest updates from the office.

These situations are examples of mobile work and how technology, although not always originally intended for it, is used to support working on the move.

3.2.1 Mobility in learning situations

Lundin and Magnusson (2003) have explored collaborative learning among mobile knowledge workers. They have identified four collaborative learning situations, which are presented below:

- *Walking into collaborative learning.* Situations where people walk around locally and communicate with other people. This could be to get specific help about something, but the mobility also created situations for learning which were dependent on the opportunistic meetings that the walks created.
- *Travelling to meetings.* The studied persons often took time to create a mutual reference background before meetings. This was done by exchanging information relevant to the meeting, such as background information and information about a customer, while being on the way to the meeting.
- *Collaborative formalization.* Efforts were made to formalize and standardize a common understanding of the practice. This could incorporate issues about how certain tasks should be performed or how certain customers should be handled.
- *Sharing without formalization.* The studied group also engaged in interactions where there were no efforts made to formalize understandings. Sharing feelings in this way could be a process of getting an impression of how different issues are perceived by others.

The collaborative aspect is emphasized in the situations described above. However, there are also studies made that focus more on an individual aspect of mobile work.

3.2.2 Mobile meetings

Interaction and informal communication are important parts of knowledge work. Conversation is an important social pattern, but different ways of communication can limit the knowledge sharing in various ways. Compared to face-to-face communication, mediated communication such as telephone, videoconference or e-mail imposes limitations in the richness of the communication. Non-verbal communication, such as body language, is for example restricted in these mediums. Other cues, such as tone of voice, are harder to detect when communicating through a medium compared to face-to-face interaction (van Dijk, 1999). Since meetings are a highly interactive way of knowledge sharing, these restrictions can be important to consider.

Meetings can be divided into formal and informal meetings, where the formal kind typically takes place in a meeting room, fulfils a specific function, is scheduled and organized after a specified agenda. The informal kind of meeting is on the other hand in general task or decision oriented, unplanned and can take place anywhere (Bergqvist et al, 1999).

Bergqvist et al (1999) have studied the possibilities of improving technological support for mobile meetings. A mobile meeting is characterized by that one or more attendants are mobile with the purpose to establish a meeting, i.e. unscheduled meetings out of the meeting room. An example of this is to walk to another person's

office to talk. Mobile meetings are different from conventional meetings by having an agenda that is dynamic and closely associated with current topics and an open set of participants. The difference to informal communication is that the mobile meeting is clearly separated from other organizational activities (Bergqvist et al, 1999). The study presents four dimensions of the mobile meeting that are important aspects to consider when designing support for mobility related to these situations.

- A big part of establishing mobile meetings is to *locate* the participants. Support for this should help locating participants.
- The mobile meeting consists of different topics – *threads*. IT-support for threads should make it clear which thread is in focus, and make switching between threads easy.
- Mobile meetings often serve as a mean of *briefing* co-workers to keep them up-to-date with current issues. Making the shared information space for the current project available when mobile can support this briefing.
- *Technology*-support currently either provides a resource for face-to-face meetings or a mean for communication with remote people. Other technical support issues are support for sharing and micro-mobility in face-to-face meetings.

Brown and O'Hara (2002) also talks about the issue of locating people to establish meetings. Their study of mobile workers shows that different technologies for asynchronous communication were used to extend communication over time. Ironically, these technologies, such as e-mail and voice-mail, were often used as a mean of arranging synchronous communication, i.e. face-to-face meetings or telephone communication.

The workers in Brown and O'Hara's (2002) study emphasized the problem of getting hold of people for a meeting, both face-to-face and over the phone. The reason the workers are mobile is in fact to be able to attend to more face-to-face interaction, but the mobile nature of their work also makes them harder to reach, and therefore harder to meet with if you are not already scheduled for an appointment (Ibid).

3.3 Personal networks

Work today is performed in an increasingly distributed manner, where business contacts can be dispersed throughout the world (Nardi et al., 2000). This implicates the importance of personal, work-related networks as a mean of carrying out daily work. There are several different forms and definitions of such networks, and we have collected those that are most suitable to our study. In this thesis we view personal networks as a resource for learning and knowledge.

3.3.1 Networking

Networking is a term that is described by Ljungberg (1997) as a way of work that typically is characterized with knowledge or service work, carried out by empowered employees who conduct work in a highly co-operative way, and where the use of IT is

essential for work. The co-operation aspect incorporates the use of personal or social networks, which is often used synonymously with networking.

Nardi et al (2000) have found that people put considerable effort in maintaining links with colleagues, friends and acquaintances in personal work-related networks. These networks are typically work-related, in which members from different organizations and departments work together in joint projects. The workers involved in a project construct such a network themselves, replacing traditional working roles and organizational resources with personal assemblages of people who work together for a determined period of time (Ibid.).

Nardi et al (2000) further states that the construction and maintaining of these networks can involve some difficulties. They have found that workers involved in networks experience pressure concerning who is who in the network, what they are doing and where they are.

To keep these networks in good working condition, the members regularly perform different tasks (Nardi et al, 2000):

- *Building a network:* adding people with knowledge and expertise important for the project to the network.
- *Maintaining the network:* keeping in touch and up-to-date with nodes in the network. We view these actions as a way of keeping in contact with nodes and to improve relations to specific nodes.
- *Activating selected nodes:* using nodes with relevant knowledge when it is required for the project.

These actions are an ongoing process to keep the network and it's nodes up-to-date, coordinated and prepared for use. We view these personal networks as a cooperative and knowledge-sharing environment constructed to assist learning in work-related situations.

3.3.2 Communities of practice

A community of practice is different from a personal network in the sense that the members are related to each other through a specific area of interest. A community of practice exists because it produces a shared practice as members engage in a collective process of learning (Wenger, 1998).

The definition of a community of practice is, according to Wenger (1998), divided into three dimensions:

- *What it is about* – the area of interest that binds the members together.
- *How it functions* – the mutual activities undertaken in the community that are the foundation of knowledge sharing and development.
- *What capability it has produced* – the range of resources developed in the community over time. Examples of such resources are different routines, artefacts or vocabulary within the community.

Wenger (1998) discusses knowledge as a key source of competitive advantage in the business world, and states that communities of practice often are responsible for the learning and knowledge sharing in organizations. These communities are widely spread throughout our whole society, and the members are bound together by what they do as a group.

The communities of practice are important to every organization, and they are vital to knowledge-based organizations where knowledge has been identified as a key asset. These communities create a space where knowledge naturally is created, shared, organized and passed on among the members (Wenger, 1998).

4 Description of organization

This chapter contains organizational and environmental descriptions of the field of study. The organizational description is intended to present a comprehensive picture of the organization where the study was conducted. The environmental description is included to provide the reader with an understanding of the environment in which our study objects mainly spend their working day.

4.1 Organizational description

We studied members of an organization belonging to a globally represented company with over 50 000 employees worldwide. The main objectives of the company are to discover new products through research and then manufacture, market and sell these products. The studied persons belong to the R&D section of the company and represents different parts of the IS/IT-departments located under R&D. These IS/IT-departments are, as the company itself, represented at different locations around the world. The studies were performed at one specific site in Sweden, where all the studied persons were mainly located.

The IS/IT-department's clients consist exclusively of other departments in the company to which it delivers products and supports with services that deals with questions regarding IS/IT.

During the last decade the company has gone through extensive organizational changes. These changes have among other things led to the company's present form of a globally distributed company with a rather complex and dynamic organization. Another result of the recent changes is that the company has transformed into a multicultural company.

4.2 Environmental description

The people we studied were mainly located at their home site, i.e. the site where they have their offices and where they are listed as employees. Several projects that they are involved in also involve people from other sites and different countries. This influences their work, which can consist of meetings at several different locations and countries in the world.

The offices are organized in several different departments, typically with narrow corridors with offices on both sides. The different departments are often not separated very clearly, and different departments sometimes share the same corridors. The persons involved in our study were located in different places at the site, as they belonged to different departments. Since they often are involved in projects with people from other departments, this disparity can cause relatively long walks whenever they need to see each other.

In the building there is a large canteen where most of the employees eat lunch. Since all employees in general eat at the canteen, this is an important place for meeting people in an unplanned and informal way.

The coffee rooms have a similar function, but with a more limited clientele. Each department has a coffee room in close proximity, which serve as a meeting place for the employees at the department. In these rooms several unplanned and informal meetings take place. It is also common that several employees take their coffee breaks together and then sit down and talk about work or other issues in a casual way.

The site has several conference rooms with various conference equipments such as video projectors, videoconference tools and whiteboards. Furthermore, several of the offices are furnished with whiteboards to make it possible to have meetings there even if such a visualizing tool is needed.

5 Result and Analysis

This chapter presents the result and analysis of the study. We describe our main findings from our observations and interview. These consist of four main themes concerning situations where knowledge sharing and learning are essential: Knowing and managing your nodes, Knowledge sharing about meetings, Locating for unscheduled meetings and Communication of availability.

5.1 Theme 1 - Knowing and managing your nodes

We observed several situations where the study objects shared knowledge and information about other colleagues with co-workers. Most of these discussions seemed to serve another purpose than just to communicate explicit work related information, but rather to communicate more personal and experiential knowledge regarding personal networks.

5.1.1 Personal Networks

The studied persons are all involved in a variety of projects at any given time. This calls for an extensive use of personalized networks with a great number of nodes. We used the list of network tasks, presented by Nardi et al. (2000), to describe this. In complement to the three tasks provided by them, we found a fourth issue that has to be addressed from time to time, namely losing nodes. The tasks are presented under the headings below.

Building a network

We use the concept of building a network as consisting of several different activities regarding the adding of a node. These tasks can incorporate preparations for adding a node, actual adding of a node and activities to introduce the node to the setting he was intended for. Learning and knowledge about existing and future nodes of the network is an important part of building a network.

To actually see when the studied persons added nodes were difficult, i.e. the actual adding of a node was hard to distinguish. The need to add nodes to your network is however important from time to time which will be illustrated below in an excerpt that was captured during a follow-up interview with Fred, one of our study objects.

> *It might just be two people in the corridor that meet each other. If one start at that level; "I ran into an internal accountant over there, he seems to be really sharp, perhaps he can work for our cause". I might say this to a colleague that also is about to meet him. This happened this very morning. I met the accountant yesterday, my colleague is supposed to meet him today. We then sit down and talk, express thoughts, first some feelings and then some concrete actions; "See to it that you mention this, so it gets more formal". We then talk a bit about how he is as an individual, that he seems to be great and trustworthy and that this person is someone that we should try and stay friends with in the future.*

In this excerpt one of our study object express the need to add a node to his and his colleagues network. The study object furthermore initiates a learning situation when he discusses how his colleague should address this new node. The learning situation consists of how Fred tries to communicate feelings and thoughts he has about the internal accountant. The actual adding of the node is however not taking place here, what is illustrated is merely the planning of a future adding. A situation where an actual adding of a node is taking place is illustrated in an observational excerpt below.

> *Fred continues to talk and explains where people in the organization are located and which relations that connects them. Phil sometimes comments or asks question concerning what Fred says. Fred seems to have great knowledge about the organization; he fills the entire whiteboard with names and lines that connect the names. It seems that the purpose of this meeting is for Fred to brief a new member, Phil, about the organization.*

The learning situation illustrated here is quite intense. Fred uses the whiteboard to illustrate relations in the organization, both formal connections and more informal working relations. The organization chart is thus combined with parts of Fred's personal network. Since Phil is supposed to join a project that Fred is involved in, this briefing seems to be a way of introducing Phil to the work-related network that he is about to be a part of. This information can be of importance for Phil in his building of a network, thus also being a situation of preparation for the adding of nodes for Phil.

Maintaining the network

We observed several situations during our study that could be related to the studied persons trying to improve and keep up relations with nodes in the network. The actions for maintaining the network are most often in the form of a social event and the person initiating it might not be aware of the consequences of the event, i.e. maintaining his/her network. This makes it difficult to distinguish such situations. The following excerpt describes a situation where a social event of sharing feelings contributes to the maintaining of the current network node, although this might not be the original intention.

> *Fred rises from the meeting with the excuse that he has to check an e-mail that he forgot. He walks to the computer and reads some parts in the e-mail out loud. The meeting continues and Sandra continues to talk about the things she spoke of before Fred interrupted her. Then Fred interrupts again, continuing to retell details of the e-mail. Obviously he is irritated with the contents of the e-mail.*

Here it seems as Fred feels a need to share the contents of the e-mail and his thoughts of it and its writer to the other participants of the meeting. Intended or not this creates a learning situation where Sandra are told Fred's thoughts and thereby their relation could be strengthened. This sharing of feelings is similar to Lundin and Magnusson's (2003) findings of sharing without formalizing in collaborative learning.

The previous excerpt was taken from a meeting situation, which not so much was influenced by mobility. The notion of maintaining network nodes was however also present in other situations where the participants were mobile. The notion of local mobility, examined by for instance Bellotti and Bly (1996), is below used to exemplify how mobility creates a situation for learning. It shows a situation where Carl, one of our study objects, gets an unscheduled visit to his office.

> *A man comes by Carl's office and Carl welcomes him cheerfully. It seems by the way they greet each other that they have not seen each other in a long time. They start to talk about what they are presently doing. Carl refers to someone he met during lunch the other day and tells the visitor about this. He then asks the visitor about the development of this issue, which he is familiar with. The meeting is very casual, the visitor is standing in the corridor and Carl leans against his doorpost.*

This unscheduled meeting is an example of a social event that we believe is a situation where Carl, or rather the person visiting him, is maintaining his personal network. In the follow-up interview with Carl we discussed the concept of informal meetings. The following excerpt is taken from that interview.

> *Some conversations downwards in the organization is merely taken place just for the sake of communication with people, to talk to them and keep the network running (...)It is a little difficult to say that you do not do it upwards but I think that you keep the network running more horizontal and downwards than upwards. You are however maintaining the network with some key persons upwards in the organization too.*

Carl acknowledges that maintaining the network nodes is an important part of work, and also that these actions are most common when communicating downward or horizontal in the organization, from a hierarchical point of view. This could be because of the social nature of maintaining the network and that such social communication is not as common upwards in the organization as downward and horizontal. The social nature of these tasks implies that they can be done very differently from person to person.

Activating selected nodes

Different nodes in the network can contribute to a certain project with different areas of knowledge. When a project demands for this specific knowledge, a suitable node is activated by a member of the project. How to know which node to choose is based on knowledge about the personal network. In some cases several personal networks can be combined to find a suitable node.

The excerpt below was captured during an observation and shows a meeting situation where two colleagues are talking about activating a node and which node to choose.

Sarah tells Carl that she is concerned that a certain technical solution to a problem is about to be standardized. She points out that they should investigate the benefits of this solution from an organizational perspective. Carl and Sarah laugh at the fact that neither of them have the time to do this. Carl suggests a colleague that could be assigned to do a pre-study on this matter. They then discuss whom they should talk to and who should be able to give their opinion on the matter.

Talking about activating nodes and which node to choose was something that occurred often during our observations. The persons involved in this discussion make use of each other's personal networks when trying to decide who is best suited for the specific project and who should have a saying in the matter. Making use of co-workers knowledge in this way was common, as exemplified below.

Ben tries to find a document on the intranet, but does not find it. He leaves the office to find and ask a co-worker about the whereabouts of the document. A colleague of Ben's, Santos, comes out of his office and Ben greets him with; "Oh, there you are!". Ben asks if he has posted the document on the intranet. Santos says yes, picks up a cup of coffee and they enter his office. He sits down by his computer and shows Ben where the document can be found.

In this situation, Ben activates a node in his network with the purpose to find a specific document. This is done by walking to the office of the colleague who was supposed to have posted the document. The success of an activation of a node is dependent on how well you have built your network, i.e. that appropriate nodes have been added and that these nodes have been maintained properly.

Losing nodes

Complementary to the list of tasks to keep the network running (Nardi et al. 2000), we found a fourth activity to consider. This would be how to handle the loss of a network node. This is done by trying to capture knowledge, vital for the organization and uniquely owned by the node. The following excerpt exemplifies a situation when a node is about to be lost.

Carl has a meeting with a colleague, Sarah. Carl mentions that one of the project members is about to leave the site after completing his part of a project. Carl and Sarah then discuss the importance of keeping the competence of this person on the site.

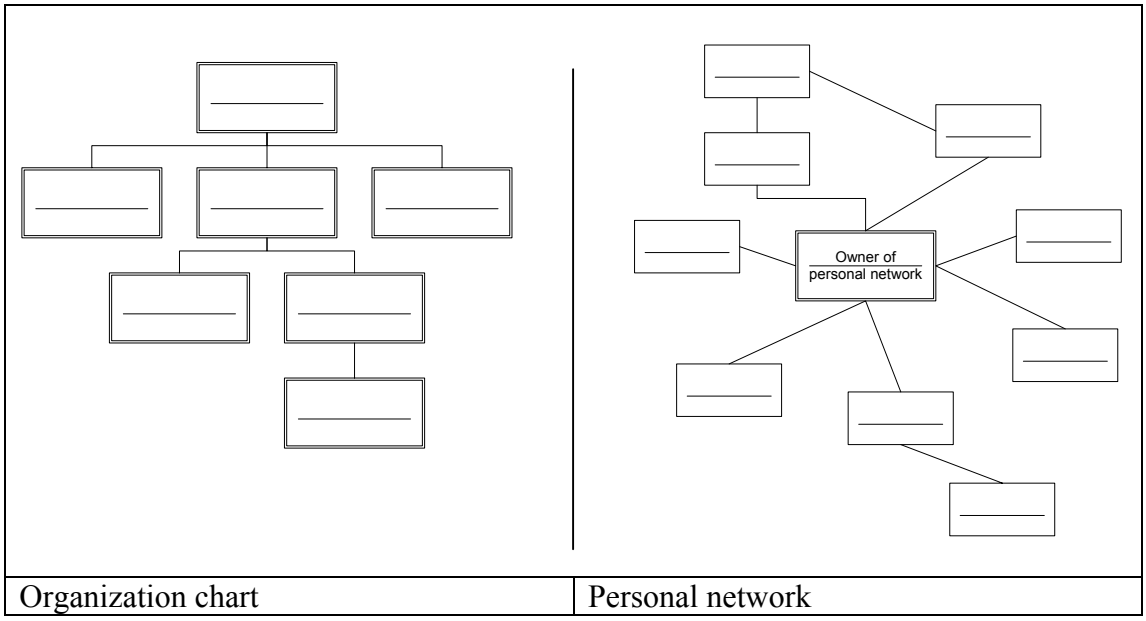
The knowledge of the referred person in this excerpt is apparently thought of as being of great importance to the organization. Carl and Sarah are forced to address the issue of him leaving the site and the problematic question of how to keep his competence within the organization. A solution would be to find a comparable node to add to the network. The loss of nodes will be a reoccurring event and the issues it raises must be addressed from time to time.

5.1.2 Knowing your nodes

The importance of knowing who's who in the network is something that we both observed in our field study and later got strong support for in the follow-up interviews. The following observational excerpt shows a situation where the knowledge of who's who in the network is used to find a person with the right qualifications to perform a specific task.

> *Carl and Eric have a meeting with the purpose to clarify the status on different projects they are involved in. Carl brings up a matter, but Eric interrupts and states that the mentioned project is not within the duties of Carl's department. They then discuss different persons in the organization who are good at performing similar tasks and therefore could be assigned to do the referred job.*

Carl and Eric here use their individual networks to try and find a node that is suitable to perform the task at hand. The actual organization chart of the company, although it is not stated explicitly, influences their discussion. The discussion that follows is however based on knowledge that goes beyond the organization chart, i.e. personalized knowledge about nodes in the network. The difference in structure between personal networks and organization charts is illustrated below.



Organization chart	Personal network

fig. 4 Illustration of an organization chart and a personal network.

It is difficult to visualize a personal network since they, in contrast to an organization chart, only exist in the mind of its owner. The example above illustrates the core of a personal network, with the owner centred, and its inner connections. It also shows how the organization chart is ordered hierarchically, while the personal network is ordered more by personal relation with different nodes.

We argue that organization charts have certain limitations as a tool for knowing who's who in the network. The information it provides is often not enough since it only is based on hierarchical relations in the organization. Knowledge regarding who's who consists of several other elements, such as personal and experiential knowledge. Organization charts are despite this often used in different situations, e.g. in the following excerpt captured in a follow-up interview.

> *Personally I use organization charts often, since it does not only show what responsibility you have in a certain project, but it also shows your primary loyalty. For instance if it is someone I work with in a project but is located in another business function, I can see what his main agenda is, i.e. who he is most loyal to in his work. It might sound crass, but it is something that is very useful to know later on when resources are fought over.*

Organization charts are hence of importance in network related issues. As exemplified above, it can show dependencies and responsibilities concerning specific persons in the organization. However, we believe that this information must be combined with more personal knowledge about the person and his surrounding to be put into context. The following excerpt exemplifies such knowledge, which cannot be found in an organization chart alone.

> *It is the classical difference in who's got formal power and who's got informal power. There are people you want to influence that formally are not in charge of a decision, but you know that they are going to have a great influence on that decision.*

This is an example where personal knowledge is combined with organizational information, creating a richer understanding of the organization than a chart alone can provide. This personal knowledge about the network is created through social interaction, typically in an informal way as exemplified in the interview excerpt below.

> *I think that much of it is discussed in informal meetings. You sit down and talk; "He is the one that sits over there, he does this and he has done this and that". I think that much of the identification of important contacts is done in those informal discussions.*

We believe that informal meetings is a powerful tool for gaining knowledge about interesting nodes in the network. The organization chart can be used to locate those nodes but the characteristics of the nodes are communicated through social interaction and experience.

5.2 Theme 2 - Sharing knowledge about meetings

Attending meetings is a big part of the working day of the studied group. These meetings are an important mean of coordinating and keeping up to date with current projects, but also a way of preparing and discussing upcoming meetings. In fact, several of the meetings we observed addressed how to act and present information at other meetings, i.e. meetings about meetings.

Furthermore, we found that the mobile workers often talk about prior meetings and what has been said and done at them. Since different projects involve a lot of people dispersed around the world and with different expertise and knowledge, meetings often affect more than just the actual attendants of it. That makes these briefing meetings a vital mean of coordinating and keeping projects members up to date.

The main purpose of these situations is learning about both factual and more personal matters. The further discussion is structured according to these two instances of knowledge sharing about meetings.

5.2.1 Knowledge sharing before a meeting

If an important meeting is coming up, the study objects often took time to prepare for this. This is often done by having meetings with people that are involved in the current project. This kind of preparatory meeting is exemplified in the excerpt below.

> *Carl then talks about the upcoming workshop, and if they should bring up the same thing that they are currently discussing. All three of the meeting attendants think so.*

Carl will attend an upcoming workshop as a representative of the group. He therefore holds a meeting with his group of co-workers to decide about their standpoint in different issues. This is fairly common, especially before larger meetings with people from different departments, where the attendants act as representatives of a larger project group. The dispersed nature of work among the studied people implies that these meetings are important to be able to represent the group and create a mutual understanding.

We have also observed that other issues than the ones mentioned above are discussed when preparing for a meeting. The excerpt below shows how attendants of the upcoming meeting are discussed.

> *They talk about the agenda for the meeting, and Ben has it brought up on his monitor. They also discuss different people that are supposed to attend the upcoming meeting, by sharing experiences and knowledge about these people.*

Ben is interested in information and knowledge about topics and attendants of the upcoming meeting. It seems to be important to prepare not only by going over agendas and standpoints, but also by discussing the attendants of the meeting and their

characteristics. The learning and knowledge sharing about other people is similar to the issue of knowing your nodes in the network, as described in the previous chapter, but the people being discussed are not necessarily a part of the personal network. The discussions are thereby more centred on issues important to know before the actual meeting, rather than to gain knowledge about a node in order to work together in the best way. This way of preparing for a meeting is also discussed by Lundin and Magnusson (2003), with the difference that they focus on preparations while travelling to meetings.

5.2.2 Knowledge sharing regarding prior meetings

Talking about previous meetings is a common practice among the workers participating in this study. Meetings are often held with a small number of attendants, who then in turn, after the meeting, get numerous questions about issues dealt with in the meeting. The questions come from a diversity of people, who may be connected to a joint work-related network and thereby have a common interest in the meeting and what has been said.

The following excerpt exemplifies the category of talking about prior meetings.

> *They start to talk about how good the meeting Carl attended this morning was. Carl retells this meeting in short, mainly focusing on the things put up on the whiteboard.*

The interesting part in this situation is that Carl is communicating his sense of the meeting as good, and then motivates this by retelling the things that he considers to be most important. Carl furthermore shares the information from the meeting without being explicitly asked to do so, probably because he thinks this information is of importance for the co-worker. This is thus an example of a situation where knowledge sharing is initiated by the source of knowledge.

These push-situations of knowledge sharing regarding prior meetings were in this study mainly concerning factual, concrete information about what has been said and done at the meeting. We have also observed situations where the knowledge sharing is mostly concerning feelings and impressions from the meeting. These knowledge-sharing situations are typically initiated by a person who has not been at the meeting, and they can hence be called pull-situations of knowledge sharing. This type of knowledge sharing is exemplified below.

> *Two men arrive to the meeting, Bob and Mike. The other meeting attendants start to talk about the meeting Bob and Mike just comes from: "okay, how was it?" Bob and Mike inform the others about the meeting and their impressions and feelings regarding this.*

Evidently the other meeting attendants are interested in what the earlier meeting had addressed, and explicitly ask Bob and Mike to share their feelings about this.

We observed several instances of this type, where people meet other people and start to talk to them about meetings they have attended. These discussions are most often started by a person who has not been at the meeting. This might imply a need to get information and be up to date in a specific issue, but could also derive from a sense of insecurity about what has been said when he or she was not there and if other people know something that they should know.

One of the study objects talked about these knowledge-sharing situations about prior meetings and why they are important. The following excerpt is taken from that interview.

> *Meeting records are often relatively concise, it is very rare that we have secretaries present to document what is actually being said, it is rather someone in the group who undertakes this task and most often we only write decisions and action records. Sometimes it is necessary to know how a decision was made, what basis for the decision that was discussed. That is not in the meeting records, because then meeting records would be pretty large and no one would want to write them. Then it can be important to get in touch with these people and ask them, how was this discussion held, why was this decision made, what was the basis. Even if you agree with the decision, the basis can be important.*

A meeting often affects a lot of people that are not participating in it. Furthermore, the information provided about the meeting, in form of meeting records and other meeting notes that sometimes are published on the intranet, do not contain enough information. This in turn means that the people actually attending the meetings are the main source of information regarding such matters. By sharing this information learning situations arise, dealing with both factual and tacit issues.

5.3 Theme 3 - Locating for unscheduled meetings

Our observations have showed that the study objects seem to put great value in spontaneous, unscheduled face-to-face interactions with people. This was also further supported in our interviews with the respondents.

> *Because these spontaneous interactions when you meet people in the corridor and solve things, like when I go to the canteen and back I can sometimes solve five things, just by meeting people. Sometimes I do it on purpose, and sometimes it just happens.*

> *I am a firm believer in "management by walking around". I think it is very important to be seen, especially if you are a project manager or have responsibility for people. You cannot just sit in your room with your door closed. Sometimes it can be sufficient just to walk by your co-workers and say*

hello to them. I am a great believer in this. It is an easy way to catch small problems before they grow out of proportion.

The respondents in these excerpts express the importance of these face-to-face interactions as a way of solving problems. However, it is common that these meetings don't always resolve the issues discussed, due to time shortage or the complexity of the subject. In these situations the discussion often results in the booking of a new meeting to further discuss the topic. This excerpt exemplifies this:

Fred meets a colleague in the coffee room and they start to talk about a specific issue that has arisen. After a short while, they agree that they need to meet to discuss this further and start to negotiate a suitable time for this.

Due to lack of time or the complexity of the subject, the conversation is decided to continue at another time and thereby creates a planned meeting. This situation is something that was observed quite often; an unplanned face-to-face meeting that results in the booking of another meeting. In these cases, the face-to-face interaction is often the trigger of the discussion and a way of addressing issues before they become critical. Since it might be the first time these issues are brought up, it is also an important learning situation that can create a new or developed understanding regarding the addressed issue.

Unscheduled meetings often arise spontaneously, for instance when two co-workers bump into each other in the corridor. Similar to the findings of Lundin and Magnusson's (2003) study, the actual walking around created situations for learning and knowledge sharing. There are however also situations where unscheduled meetings are conducted for a specific purpose. In these situations a certain person is sought after to establish this meeting, which makes the issue of locating essential.

5.3.1 Locating

We observed similar problems with locating people as the ones described by Brown and O'Hara (2002). These problems are due to the mobile nature of work among the people we studied, which makes them hard to reach. The following excerpt shows how locating a person could be problematic.

John goes to the conference room to see if Mark is there. He is not, so John calls him. The line is busy, so John goes back to his office and continues his work on his laptop.

This is a symptomatic example of how mobility of people actually can make it hard to locate them. The mobile phone is often used to locate people, but as seen in the above excerpt, this method isn't always successful.

Following excerpt further shows how the mobile phone is used to locate people:

Ben walks to Alex's office to talk about their upcoming meeting, but Alex isn't there. Ben uses Alex's office telephone and phones her. Alex answers and Ben finds out that she is on her way back to her office.

In this case, the mobile phone proves to be a successful way of locating other people, even though Ben's example illustrate that this is sometimes not the first choice for this purpose.

The follow-up interviews showed that the choice of different ways of locating people often is decided by the proximity of the person and knowledge about the person's habits and priorities. If a person is in close proximity the most common way of trying to locate them is to go to that person's office. If the person is not there, other ways of finding him or her are used, as the excerpt above illustrates.

It seems as knowledge about the nature of work of certain persons and their habits surrounding their work influence the preferred way of locating them. Following interview excerpt exemplify this:

I prefer, I find it easier, to talk to people than to use e-mail. So I rather talk to people directly, and in those cases it matters where they are. If I want to get in contact with someone who is located in the barracks over there, I rather go there than call the person on the phone. Possibly, if I know that this person is out a lot, I call first to see if he is there and then walk over there and talk instead of calling. Because you get a lot more information, it is a much easier way to communicate.

If the respondent knows that a specific person is out of the office a lot, using the phone is a more secure way to locate him or her than actually walking over to the person's office. This shows how knowledge about a person is used to decide a way for locating.

Several other ways of finding people, besides trying to locate them through local mobility and calling the mobile phone, were observed during our study. For example, the calendar, which is a shared resource within the organization, could be used to see if a person was occupied in a meeting or out of the site. Another option mentioned by one of the respondents was to phone a person in proximity of the person you want to reach, in case this person is out of the office.

5.4 Theme 4 - Communication of availability

The people we have studied all have a coordinating role in the organization, with a lot of different people linked to them in different work-related networks. Daily work is revolving around communication with these people in different forms, for example face-to-face interaction, e-mail or telephone. These are all different ways of getting in contact with people, but there are situations where the person you wish to contact might not always be available for communication.

There are a number of different reasons for people to be unavailable. For example, they could be in a meeting, they might be out of the office or they simply do not want to be disturbed because of some urgent work that has to be done. We argue that the issue of availability have a significant impact on the way communication between people in the organization is done, which influence how different communication means are used in different situations and how different cues and methods are used to signal availability.

A person's availability is a difficult thing to know, even though various methods for signalling this have been observed. Some of these methods are used generally throughout the organization while some methods are more personal. These person-related methods are signals that the nodes in the network must learn to interpret. The different methods that we observed are divided into categories and further explained below.

5.4.1 Calendars

A common way in this study of knowing if a person is occupied or not is by checking his or her calendar. Since the calendars are a shared resource on the intranet they are available to everyone in the organization, and if kept up to date it can be used as a tool for signalling and checking availability. This was also supported in our interviews, as exemplified here:

> *If I want to meet with a person in this building and I don't get hold of him or her, I can call the person who sits next door, if I know this, to check if the person has even arrived or not. But before I take such a step, I usually check the calendar and see if he or she has updated it. But there are many people who don't use their calendar, you have a feeling for, you know pretty well who uses their calendar and who doesn't.*

Here, the respondent states how the calendar can be used to see if a person is available. Since everyone doesn't use the calendar in the same way, it is important to have specific knowledge about a person's habits in this matter to be able to use this tool effectively. We believe that the consequence of this is that calendars are limited as a tool for signalling and checking availability and used mainly within smaller groups where this knowledge exists.

5.4.2 Office doors

As Ljungberg and Kristoffersen (1999b), we observed that the office door is another method of signalling availability. The doors to the offices at the site we observed were in general open, giving the employees possibility to interact with each other easily. To shut the door provides a signal that the person in the office is occupied with something and seeks privacy. If someone wants to talk with the person they either wait for the person to become available, choose another medium of communication or knock on the door and tries to see the person anyway. Therefore, the closed door does not seem to signal a complete unavailability but rather a certain degree of less availability than the open door. The excerpt below is an example of this:

> *The door is closed during this meeting. A woman knocks on the door and enters. She sees that Ben is occupied in a meeting and excuses herself, saying that she will call Ben later instead.*

This shows how the unavailability of a person triggers the use of another, more suitable communication medium. Since face-to-face contact is impossible at the moment, the communication is postponed and held over another medium, more suitable for that time.

To signal a complete unavailability, some people in our study use a sort of do not disturb-note on the door, for example when they are attending telephone conferences or need to make a deadline. This extended use of the door, as a signal of availability is however not used as often as the open and shut door.

There are no spoken rules or organizational directives regarding how to use and interpret this kind of signal. This is something that has to be learned, and people from outside the organization might not know how to interpret the shut door and what it signals.

5.4.3 Personal cues

Our study shows that there are other signals that are even more subtle and that we believe require a great deal of understanding about people's personality and habits to interpret. This interview excerpt illustrate such a signal:

> *When I want to talk to someone, and can't use e-mail, I call him or her. Then I try to listen, in the beginning, how they answer. If they answer in a whispering way I usually ask them if they are in the middle of something: "yeah, ok. Can you call back or should I call you?". And then that's it, it's a way to reduce the interruption.*

This illustrates how subtle signs and cues can be picked up and work as a communication of availability. These cues might however be a lot different from person to person, and it often requires knowledge about the person's specific approach of mediating them to be able to interpret them.

We found that learning about how different people respond to different situations and communication mediums is important when trying to establish communication. A good example is stated in this interview excerpt:

> *E-mail is something that you trust a lot (...). If you send e-mail as a CC (Carbon Copy) and knows that the person you're sending it to seldom reads CC-mails, the whole point is lost.*

This example shows how a person makes himself unavailable for a certain kind of communication, simply by neglecting to read a certain category of e-mail. This is probably a screening process aimed to help discard information and communication believed to be unnecessary. We believe that learning such things about people in your network is essential to have an effective communication and to avoid mediums that won't result in any response.

5.4.4 Asynchronous communication

To avoid interruptions, the mobile phone was often turned off in situations where a person considers himself to be unavailable for communication. This was most common in meeting situations, where a call might be disturbing both for the person receiving it and to other attendants of the meeting. Because of this, we observed that voice-mail was a widespread way of communication when a person was unavailable. We believe that asynchronous communication, such as voice-mail and e-mail, is a non-intrusive way of communicating that work as a trigger for further communication. The following excerpt illustrates the use of voice-mail in such a situation.

> *Carl calls a person but get no answer. He leaves a message on the voice-mail, saying that he will be in his office today until 13.00, and that he has a meeting between 13.00 and 14.00, Swedish time (the contents of Carl's message makes it obvious that the other person has called Carl yesterday and left him a message).*

In the message, Carl signals clearly when the other person can call him back, and that he is occupied after this period of time. It also shows that Carl and the other person have been in some contact before without getting hold of each other. Our study has shown that it is quite common that people are unavailable to the extent that most of the communication is done through asynchronous mediums. In this way, asynchronous communication is used to extend communication over time, usually by requesting synchronous communication with the person at a later instance. This is similar to the findings of Brown and O'Hara (2002).

6 Design implications

This chapter presents design implications deriving from the findings of the study. The implications are divided into four themes according to our findings, where we discuss how IT could support the different situations, what should be considered when designing for these situations and also more concrete suggestions for design.

6.1 Knowing and managing your nodes

The studied knowledge workers are to a great extent dependent on their network nodes in order to perform their work. To add, maintain, activate and handling loss of selected network nodes tasks were performed frequently during our observations. To support these activities with IT might be difficult considering the complexity of the tasks. We below present issues, deriving from our study, which are important to consider when designing for these tasks.

Social interaction

Some sort of social effort seemed important in order to perform any of the four listed activities successfully. This is important to consider when trying to support adding or maintaining network nodes. We believe that it would be of great value to be able to perform network tasks at a distance. However, since these tasks are social, they can be hard to support by replacing face-to-face communication with some sort of mediated communication. A more suitable approach would be to design support for the existing communication rather than inventing new ones. One way of supporting communication can be to design for information access regarding nodes and their characteristics. At the presence most of this information is merely stored in the mind of the network owner and by making this information more tangible, social learning situations regarding these issues can be supported.

Context

Given the high factor of mobility and especially local mobility in the studied persons work, the network tasks are often performed in a mobile context. The people in this study walk around a lot and talk to different people in different places. This means that mobility is a factor that cannot be ignored when designing support for network tasks. A support for information access regarding a personal network should be possible to use in both mobile and stationary contexts, and the presentation of information should be adjusted accordingly. In a stationary setting, a more detailed presentation is possible due to the larger screens often available. In mobile access, the presentation of information must be adapted and adjusted to suit a tool that is relatively small and portable. Other issues that must be considered when designing for mobility is input possibilities, power supply and network access.

Visualization

The issues of knowing your nodes seemed to be common in more or less informal meetings where both personalized and common, static organization charts were used. Typically the organization chart was drawn on a whiteboard in order to visualize and discuss it in a meeting. However, we believe that the organization chart could be of

use in other, more mobile settings as well. Since we observed that unscheduled meetings seemed important for learning, these situations could benefit if a support for sharing an organization chart was incorporated in a mobile tool. Such a support would work as a trigger and aid for discussion about network nodes.

Below we summarize our design implications.

- The social nature of the tasks implies that IT support should focus on aiding face-to-face communication rather than trying to replace it with mediated communication.
- The tasks regarding the personal network are performed in various contexts and therefore mobility must be considered.
- Organization charts are at present mainly visualized in stationary settings. We however believe that a support for visualizing this in a mobile setting could be of use.

6.2 Sharing knowledge about meetings

The nature of the knowledge-sharing situations relating meetings is an important aspect to consider when designing IT-support for these occurrences. The knowledge sharing before a meeting is typically quite different from knowledge sharing about a prior meeting, with different conditions and settings. Therefore, these two situations are separated when discussing design implications for them.

6.2.1 Knowledge sharing before a meeting

We found that the knowledge sharing situations before a meeting often seemed to be a way of creating a common understanding about issues regarding the meeting. These situations typically take place at a scheduled meeting, where the involved persons have time to prepare and think about what they want from the meeting. The time and place for this meeting is often decided in advance, as is the list of attendants. The aim of these meetings is to gain knowledge about different areas of interest before the meeting, and to decide how to act and present information at the meeting. Supporting the sharing of explicit knowledge can be done by using different tools for information access and presentation. Since these preparatory meetings are often held in a stationary setting, for example in an office or a conference room, tools like the intranet and other shared resources can be utilized to make information available.

Since there often are several persons holding knowledge of importance regarding certain issues, a shared resource for discussions and reflection could support the establishment of a mutual understanding before a meeting. This resource could be intranet based and in the form of different rooms created by a specific person who also could decide which persons that should have access to the room. By making the shared resource restricted the discussions can be held in a relatively private environment between network nodes. We believe that such a forum would stimulate the actual preparatory meeting by raising important questions and thoughts through an open discussion among persons associated with the meeting in some way.

6.2.2 Knowledge sharing regarding prior meetings

We observed that the main way of gaining knowledge about prior meetings was to communicate with a person that had actually been at the meeting. This implies that an important issue regarding these post-meetings is to know if a certain meeting has taken place and who have been attending it. A tool that could supply information about meetings that are of interest to a specific person could also act as an initiator for further knowledge sharing.

Below we summarize our design implications.

- The preparatory meetings could be supported by tools for information access and presentation, which could be helpful when sharing explicit knowledge.
- A shared resource for discussion and reflection can stimulate the raise of thoughts and ideas before a preparatory meeting.
- Support for information about prior meetings of interest can aid the initiation of knowledge sharing regarding these.

6.3 Locating for unscheduled meetings

During the observations we discovered that attempts to locate people for unscheduled learning situations in the form of informal meetings were a quite frequently occurring event. Our study objects expressed that these unscheduled meetings were situations important for learning and knowledge sharing. Trying to support the locating of people in order to establish unscheduled meetings can thus also indirectly support the initiation of learning situations.

A common decider for which method to choose in order to locate someone was the actual distance to the selected node. If the walking distance was considered long, another method was chosen prior to looking for the person in his/her office. Another issue affecting this choice was knowledge about whether a person spent a lot of time at a certain place and therefore was likely to find in this place. This knowledge is personal and based on experience. Information regarding this could however be made further available by displaying some sort of statistics of the time a person spends at different locations. Such support would show if a person spends a lot of time at the office, which could make the locating issue less cumbersome.

Our results furthermore show that it is not uncommon to walk around in the building as a method to locate people. Our study objects expressed that the unplanned and spontaneous meetings were a common way of resolving problems before they become critical, and thereby an important part of work. The initiation of these walks could be supported by an application that decides which co-workers that the user should visit during the day. These visits can be randomly chosen from the personal network of the user, making sure that the unplanned meetings are held with different people from day to day.

Below we summarize our design implications.

- Supporting locating can also indirectly support the initiation of learning situations.
- Statistics of the time spent at different locations could aid the process of choosing method for the locating of people.
- An initiator tool for unplanned, spontaneous meetings could be beneficial in order to create unscheduled learning situations.

6.4 Communication of availability

The issue of availability is interesting, since it many times is hard to get hold of a certain person at a certain time. Different methods are used to get around this at present, where asynchronous communication is one of the most common. E-mail and voice-mail are used to leave messages and in that way extend communication over time. There are also methods for signalling availability to others, for example shutting the office door, but there is no tool designed solely for the purpose of knowing others availability. Knowing other peoples availability can affect the actual initiation of learning situations, and therefore be valuable to support.

The design implication is therefore to incorporate a common tool for checking and signalling availability. Availability can be signalled by determining which communication mediums are eligible to use in a specific situation. This would create an ordered list of choices for communication, and thus also showing second and third "best" choices if the first one fails. This list can be requested to see which communication mean is the most suitable for the current situation. Both checking and signalling should be possible to access from a stationary setting as well as in a mobile context, for example from a mobile phone. With such a tool redundant communication, such as calling a mobile when a person is in a meeting and thereby unavailable, could be avoided.

There also exist different personal cues to communicate availability, which must be learned and understood in order to interpret them. This learning is mainly done through social interaction with co-workers, which must be considered when designing support for this.

Below we summarize our design implications.

- Initiation of learning situations can be supported by aiding communication of availability.
- A common tool designed explicitly for communication of availability where the user chooses preferred means of communication could exclude redundant communication.
- Knowledge about personal cues for communication of availability is obtained through social interactions, and therefore this social aspect must be considered.

7 Discussion

In this chapter we discuss our results and suggest further research. Finally, we present our conclusion in which we answer our research questions.

The use of personal networks was observed frequently in our field study. A great part of the study objects work is made in co-operation with others and they rely to a huge extent on their personal networks on a daily basis. These networks are based on very personalized information and knowledge about both the actual network nodes and the tasks that are done to keep the network up and running. The learning situations we observed were to a large extent linked to the personal network, which is why this has become an important part of this thesis. The different interactions regarding the network are in fact learning situations, where tacit and explicit knowledge is shared to create an understanding about nodes in the network and their work.

The focus on learning distinguishes this study from other studies of knowledge management and networking in work settings, such as Hawryszkiewycz (1999), Ljungberg (1997) and Nardi et al (2000). By focusing on learning and presenting design implications to explicitly support the situations we have observed, this study can provide a further understanding of learning in knowledge work. Lundin and Magnusson (2003) have a similar focus in their study, but they are explicitly interested in collaborative learning. This thesis has a broader perspective, presenting situations important for learning but also issues regarding the initiation of learning, such as locating people for interaction and knowing other peoples availability. Thus, our study also incorporates individual aspects of learning as well as collaborative. Although some findings in this thesis are comparable to Lundin and Magnussons findings, there are dissimilarities that are grounded in the differences in work setting and the studied persons way of performing work. Thereby this study complements the study of Lundin and Magnusson, and further more shows how important it is to have specific knowledge about a work setting to understand how to support learning in that context.

7.1 Further research

Most of the field study was done at the studied persons primary workplace. The travelling that took place and was observed cannot be considered as representative for the studied group. Although the amount of travelling was representative, too few travel days and too few kinds of travels were made to make any real conclusions about the travelling in general. Travelling and work at distant locations is a large part of work for the studied knowledge workers and would be interesting to examine further, not least due to the factor of mobility that this brings. As the study was carried out, the notion of local mobility got a far bigger part than other forms of mobility, e.g. remote mobility.

Our study did not include development of IT-support for the studied knowledge workers. It would be interesting to try our design implications via a mobile tool used a

period by the studied knowledge workers at their work location. The try-out period would include a thorough evaluation performed closely to and with the test users.

7.2 Conclusion

The aim of this thesis was to understand how knowledge sharing is used by mobile knowledge workers, and how it can be supported by IT. To achieve this purpose we set up two research questions. In this section, we aim to answer these questions.

> *How do mobile knowledge workers engage in knowledge sharing in their daily work?*

We observed that knowledge sharing was used in two main ways: sharing of knowledge regarding factual and concrete issues, for example information about a project, and sharing of knowledge regarding more personal and tacit knowledge, typically knowledge about a specific node in the personal network.

> *How can knowledge sharing among mobile knowledge workers be supported by IT?*

The social nature of many of the networking activities where knowledge sharing took place must be considered when designing IT support. Because of this, we believe that it is more suitable to design support for the actual interaction than to try to find replacing methods of communication. Furthermore, the mobile aspect is also important to consider since the studied persons engaged in knowledge sharing regardless of setting. This implies that support should be available in mobile settings as well as in more stationary ones. Our study also shows that it is important to know where people are and what they are doing in order to initiate learning situations. To support this can therefore serve as a support for learning and knowledge sharing.

8 References

Alavi, M. & Leidner, D.E. (1999). *Knowledge Management Systems: Issues, Challenges, and Benefits*, Communications of the Association for Information Systems, Volume, 1, No 2.

Alavi, M. & Leidner, D.E. (2001). *Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues*, MIS Quarterly(25),1, pp. 107-130.

Bellotti, V. & Bly, S. (1996). *Walking away from the desktop computer: Distributed collaboration and mobility in a product design team.* In proceedings of Conference on Computer Supported Cooperative Work 96, New York: ACM Press.

Bergqvist, J., Dahlberg, P., Ljungberg, F. & Kristoffersen, S. (1999). *Moving Out of the Meeting Room: Exploring support for mobile meetings,* In proceedings of the european conference on computer supported cooperative work, Copenhagen, Denmark.

Brown, B. & O'Hara, K. (2002). *Place as a practical concern of mobile workers*. To appear in: Environment and Planning A.

Collins, M., Hedberg, B., Hansson J., Olve, N-G. & Westin, C-J. (1998). *Fem röster om Knowledge Management - Kunskapsledning för kunskapsdelning*. Stockholm: Konsultbolaget Cepro.

Davenport, T. H. & Prusak, L. (1998). *Working Knowledge - How organisations manage what they know*. Boston: Harvard Business School Press.

Easterby-Smith, M., Thorpe, R., & Lowe, A. (1991). *Management research : an Introduction,* London, SAGE Publications.

Ellström, P-E. (1992). *Kompetens, utbildning och lärande i arbetslivet; Problem, begrepp och teoretiska perspektiv*, Stockholm: Norstedts juridik AB

Emerson, R M., Fretz, R.I. & Shaw, L.L. (1995). *Writing Ethnographic Fieldnotes,* Chicago, IL: University of Chicago Press

Eriksson, L.T. & Wiedersheim-Paul, F. (1997). *Att utreda, forska och rapportera.* Malmö: Liber Ekonomi.

Grant, R.M. (1996). *Prospering in Dynamically-Competitive Environments: Organizational Capability as Knowledge Integration*, Organization Science(7),4, pp. 375-387.

Hansen, M. T., Nohria, N. & Tierney, T. (1999). *What's Your Strategy for Managing Knowledge?,* Harvard Business Review, 1999, March-April, p.107-116.

Hawryszkiewycz, I.T. (1999). *Knowledge Sharing through Workspace Networks,* In proceedings of the Special Interest Group on Computer Personnel Research (SIGCPR99), April 1999, New Orleans (ISBN 1-58133-063-5), pp. 79-85

Holme, I. M. & Solvang, B. K. (1997). *Forskningsmetodik; Om kvalitativa och kvantitativa metoder*. Lund: Studentlitteratur.

Hughes J., King V., Rodden T. & Andersen H. (1994). *Moving Out from the Control Room: Ethnography in Systems Design*, in Proceedings of CSCW 94 (Chapel Hill, NC USA, 1994), ACM Press, 429-439.

Järvinen, P. (1999). *On research methods*. Tammerfors: Okinpaja Oy.

King, W.R., Marks, P.V.Jr. & McCoy, S. (2002). *The most important issues in Knowledge Management*, Communications of the ACM, vol 45, no. 9.

Kvale, S. (1997). *Den kvalitativa forskningsintervjun*, Lund: Studentlitteratur

Ljungberg, F. (1997). *Networking*, Gothenburg University, Informatics, Sweden.

Ljungberg, F. & Kristoffersen, S. (1999). *Mobile Use Of IT,* In Proceedings of The 19th Information Systems Research Seminar in Scandinavia., edited by Käkölä, T., Jyväskylä, Finland.

Ljungberg, F. & Kristoffersen, S. (1999b). *An Empirical Study of How People Establish Interaction: Implications for CSCW Sessions Management Models.* In proceedings of CHI'99, ACM press.

Ljungberg, F. & Wiberg, M. (1999). *Exploring the vision of anytime, anywhere in the context of mobile work*. In Knowledge Management and Virtual Organizations, Y. Malhotra, Ed. Idea Group Publishing.

Ljungberg, P. & Kristoffersen, S. (2000). *Mobile Informatics,* In Planet Internet, edited by Braa, K., Dahlbom, B., Sørensen, C., Lund: Studentlitteratur.

Lundin J. & Magnusson, M. (2003). *Collaborative Learning in Mobile Work*, Viktoria Institute working paper.

Merriam, S.B. (1994). *Fallstudien som forskningsmetod*, Lund: Studentlitteratur.

Nardi, B., Whittaker, S. & Schwarz, H. (2000). *It's Not What You Know, It's Who You Know: Work in the Information Age.* First Monday, Vol. 5. No. 5

Nonaka, I. (1994). *A Dynamic Theory of Organizational Knowledge Creation,* Organization Science(5),1, pp. 14-37.

Nonaka, I. & Konno, N. (1998). *The Concept of "Ba": Building a Foundation for Knowledge Creation,* California Management review(40),3,pp.40-54.

Perry, M., O'Hara, K., Sellen, A. Harper, R. & Brown, B.A.T. (2001). *Dealing with mobility: understanding access anytime, anywhere.* ACM Transactions on Human-Computer Interaction, 8 (4), p. 1-25.

Repstad, P. (1999). *Närhet och distans; Kvalitativa metoder i samhällsvetenskap.* Lund: Studentlitteratur.

Van Dijk, J. (1999*). The network society: social aspects of new media*. London: SAGE 1999.

Wenger, E (1998). *Communities of Practice – Learning as a Social System*, The Systems Thinker, Pegasus Communications.

Wasson, C. (2000). *Ethnography in the Field of Design,* Human Organization, 59(4), (377-388).